CHAPTER I

INTRODUCTION

1. 1 PRINCIPLE AND RATIONALE

Climate change and global warming are the recently critical problems of the world. They affect the environment, global vegetation, seasonal periods and also all of ecological relationships. The effects are still increasing. Tropical forests are regarded as one of the most important ecosystems that provide resources and release a huge amount of oxygen. Therefore, biodiversity and ecology knowledge in the tropic areas are still necessary to be investigated and preserved.

Not many plant species are regarded to be 'key stone' of the forests, *Ficus* or fig trees are one of these in tropical forests (Power, 1966 in Shanahan *et al*., 2001a; Benders, 2002). It is one of the large genera that contains about 750-1,000 species worldwide; about 120 species in North and South America, 105 species in Africa, approximate 367 species in Asia and Australian regions. The remainders are probably in several areas, which are still undiscovered (Corner, 1965; Berg, 1989; Berg and Corner, 2005, Figure 1.1). In ecosystems, the fig fruits are year-round food supply for several animals such as pigeons, parrots, hornbills, toucans, monkeys, gibbons and fruit-eating bats. This genus is also a pioneer species of the forests because they are fast growing and widely distributed (Benders, 2002). In open areas, for example, landslips at altitude up to 1,500 m in Borneo, figs in section *Sycomorus* role good secondary vegetation. Although in Volcano Island, these plants can form their colonies e.g. the Krakatau Islands between Java and Sumatra and Long Island near Papua New Guinea (Shanahan *et al*. 2001b).

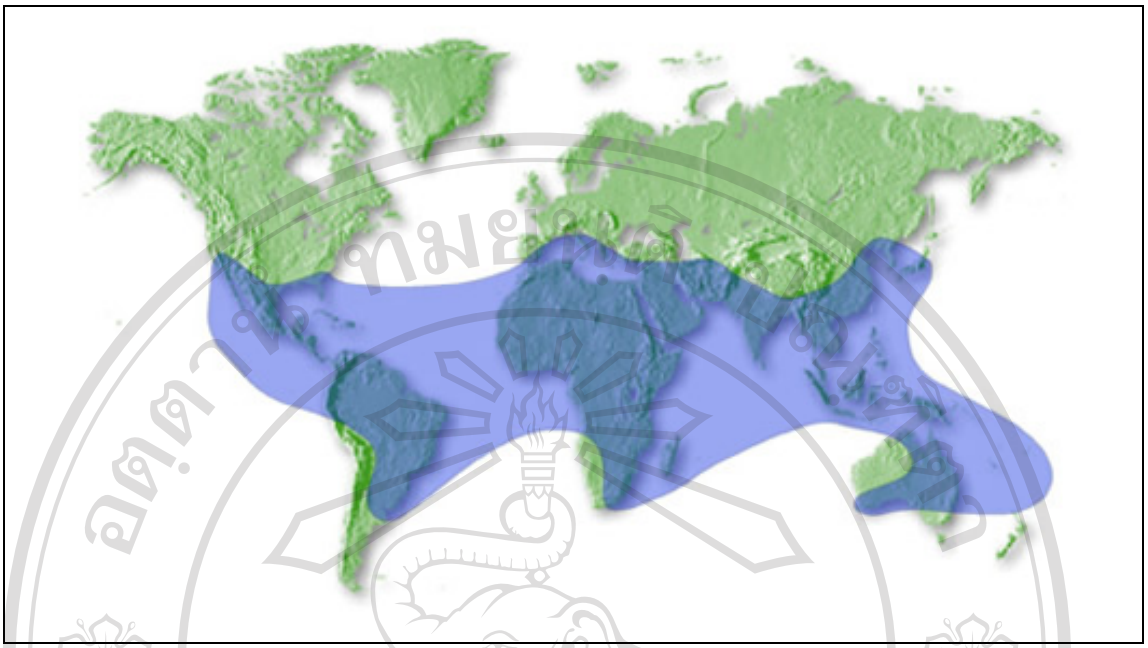

Figure 1.1 Distribution of *Ficus* species in the tropic zone (Noort and Rasplus, 2005a).

Figs are not only valuable for wild animals, but also for human as well. Condit (1969) reported that all parts of fig could be used, e.g. juvenile shoots and leaves of *F. virens* Aiton and *F. hirta* Vahl used as vegetable, ripe fruit of *F. nota* was sweet in taste. Latex of *F. benjamina* L. was used for inhibiting distribution of malaria mosquitoes, latex of *F. variegata* Blume, in Malaysia, used for Godang wax in batic dye and latex of *F. dusenii* used for bird's trapping. Some species were used for fiber and raw material for paper making. *Ficus carica* L. is a popular edible fruit and many species are used for gardening.

The fig is one of the earliest fruits cultivated; people use both fresh and dry figs to be the source of energy. It was included in many stories and history for a long time. 'Figs' frequently occurred in the bible and also included in the Eden Garden. The fig was the favorite fruit of Cleopatra and her death was caused by the asp (vipers snake) in the fig's basket. It was believed to be the best food for fast healthy recovering from sickness and make people look younger with a few wrinkles. In addition it was a highly prized in the original Olympic Games that the winners were given fig wreaths and fig as the price (Vinson, 1999).

The popular fig, which is represented in the history until now is a common fig (*Ficus carica* L.), the well-known edible species of temperate fruit which is declared to be a healthy fruit with low sodium, cholesterol, fat but high in calcium and fiber. The recent publications reveal that 'figs' are beneficial in reducing risk of cancer and heart disease (Vinson, 1999). Moreover, some of *Ficus* species are very significant in culture and religion; Bho, *F. religiosa* L., the tree that the lord Buddha sat under and had revelation that formed the foundations of Buddhism (O′ Brien, 2008).

Figs provide a variety of natural products such as medicines, cosmetics, and functional foods. Leaf extract of *Ficus racemosa* L. can be used for anti-flammatory and leaf extract of *F. hispida* L. can be used to inhibit diarrhoeal activity that causes children mortality in developing countries (Mandal *et al*. 2000; Mandal and Kumur, 2002). Although the usefulness of fig trees is generally represented, not many people know about their life and incredible biology. It is one of the plant genera studied for plant and animal evolution.

Each fig species is believed to have a unique pollinator and their interaction is thought to be one-to-one (one species of fig tree and one species of pollinator wasp). Their pollinators are the insects of Agaonidae family in order Hymenoptera. The interaction is called obligatory mutualism (Weiblen, 2002). The specific relationship is popular for biologists studying co-evolution between the two species. Although there are many studies of their relationship, it is rarely clear. To support the knowledge, their function and structure must be repeated in investigation, especially with the large number of species of the diverse genus. It will be beneficial to predict their crops and production, which related to other biotic components in ecosystem (Berg, 1989).

The knowledge and studies of this genus were conducted in some areas of the tropic zone, such as Africa, South America, Australia, India, Malaysia and South of China (Aigoin and Kjellberg, 2006). It was treated not only for pollination, but also other fields such as phenology, dispersal, distribution, germination, hybridization and phytochemistry.

In Thailand, it was expected approximately 80-100 species of figs distributed throughout, but there have been only a few research of these plants. Most of them were related to plant diversity in some areas or the usage of them. For example, the

studies of ethnobotany in some areas of Thailand. Those publications reported the benefits of fig tree with indigenous knowledge such as the usage of juvenile leaves and syconium of *F. racemosa, F. auriculata* Lour., *F. lacor* Ham. and *F. fistulosa* Reinw ex. Bl. as vegetable. *F. racemosa, F. auriculata, F. semicordata* Buch-Ham. ex. J. E. Sm. and *F. hirta* Vahl were used as the fruits with sweet taste. Some species used as medicinal plants such as *F. hispida* (Ponpim, 1996; Tovaranonte, 1998, Tangtrakul *et al*., 2001).

The knowledge of taxonomic study was just recently presented in a few years, however this genus is being studied taxonomically by the professional botanists of the Flora of Thailand Project (Berg, 2007). Unfortunately, the investigation of figs and their pollinators in Thailand have never been published. This information is very important as much as its taxonomy, because of their variation which is evolved by fig characters and their specific wasps for several millions of years. Chiang Mai has a diverse physical characteristics with the elevation from 310-2,565 m asl., many types of forest are represented such as dry evergreen forest, mixed deciduous forest, deciduous dipterocarp forest, lower montane coniferous forest (Santisuk, 2007). Therefore, it is a suitable site to study plant diversity and also this was chosen to investigate *Ficus* under the differences of microclimate and elevation.

1.2 OBJECTIVES

1. To study taxonomy of some figs and their pollinators
2. To investigate interaction between some figs and their pollinators